

REMARKS

Claims 1-7 remain pending after amendment.

Objection to Drawings

Applicants note the Examiner's objection to the drawings. However, the Examiner does not indicate in the Official Action the basis for the noted objection. Applicants accordingly cannot address the objection absent greater specificity for the objection. Applicants thus request that the Examiner be more specific regarding the basis of the objection so that applicants may provide a response thereto.

Specification Amendments

Various editorial amendments are made to the specification to correct inadvertent errors.

The amendment to page 10 corrects an inadvertent error which occurred at the time of the translation into English from the Japanese PCT application. Specifically, the tradename "RM-65" which resides at page 6, lines 20-21 of the Japanese PCT application was inadvertently omitted during preparation of the English translation.

The amendment to page 29, line 18 also corrects an inadvertent error which occurred at the time of the translation into English of the Japanese PCT application. The magnification "x 10,000,000" is corrected to "x 100,000".

The amendment to page 30, line 5 is also a correction of an inadvertent error which occurred at the time of the translation into English of the Japanese PCT application. The noted formula is corrected to reflect the correct symbols.

The amendment to page 64 at page 12 is similarly a correction of an inadvertent error which occurred at the time of the translation into English of the original Japanese PCT application. The phrase "organic sulfonic acid" is amended to read "alkali metal salt of an organic sulfonic acid".

In support of the noted amendments, applicants submit herewith a Declaration which verifies

that such errors occurred at the time of the preparation of the English translation of the Japanese PCT application.

No new matter is added by this amendment.

Rejection of Claims 1-5 and 7 under 35 USC 102(e)

Claims 1-5 and 7 stand rejected under 35 USC 102(e) as being anticipated by Hirai et al U.S. Patent No. 6,664,313.

This rejection respectfully is traversed.

In support of the rejection, the Examiner states as follows:

“Hirai et al. disclose polycarbonate, titanium dioxide (filler), silica and PTFE in claim 1, organosulfonic metal salts in claim 12, transesterification in column 2, lines 30-31 (melting method or ester exchange method), fumed silica in column 5, lines 1-12, silane treating the silica in column 5, lines 13-21 and glass fiber in column 10, lines 7-14. Applicants’ claims are not novel.”

As described at page 8, line 4 to page 9, line 14 of the present specification, the object of the present invention is to provide a flame retardant aromatic polycarbonate resin composition which exhibits excellent flame retardancy without using a conventional bromine-containing or phosphorus-containing flame retardant (which adversely affects the properties of the resin composition due to the unsatisfactory thermal stability thereof and is harmful to the environment), and which, in addition, exhibits excellent melt stability without sacrificing the excellent thermal resistance and impact resistance which an aromatic polycarbonate inherently possesses.

Conventionally, various attempts have been made to improve the above-mentioned properties of the flame retardant aromatic polycarbonate resin composition. However, the conventional techniques suffer from a technical dilemma that, when some of the above-mentioned properties are improved, other properties are sacrificed, so that it has been difficult to simultaneously improve all of the above-mentioned properties (see page 2, line 6 to page 7, line 24 of the present specification).

The present inventors have made extensive and intensive studies and found that the above-

mentioned object of the present invention can be achieved by a flame retardant aromatic polycarbonate resin composition as claimed – that is, a flame retardant aromatic polycarbonate resin composition comprising:

100 parts by weight of an aromatic polycarbonate (A),

0.01 to 0.5 part by weight of branched metal oxide particles (B), each independently being a branched metal oxide aggregate or a branched metal oxide agglomerate,

0.0001 to 0.2 part by weight of an alkali metal salt (C) of an organic sulfonic acid, and

0.01 to 0.5 part by weight of a fluoropolymer (D),

the branched metal oxide particles (B) being dispersed in a mixture of the aromatic polycarbonate (A), the alkali metal salt (C) and the fluoropolymer (D),

wherein at least 70 % of the branched metal oxide particles (B) have a diameter within the range of from 10 to 200 nm.

The effects achieved by such a flame retardant aromatic polycarbonate resin composition of the present invention are clearly confirmed in the Examples and Comparative Examples of the present application. That is, the Examples and Comparative Examples of the present application clearly show that the flame retardant aromatic polycarbonate resin composition of the present invention which contains components (A) to (D) in the recited amounts enables the following advantages to be achieved:

(1) excellent flame retardancy without using a conventional bromine-containing or phosphorus-containing flame retardant (which adversely affects the properties of the resin composition due to the unsatisfactory thermal stability thereof, and is harmful to the environment); and

(2) excellent melt stability without sacrificing the excellent thermal resistance and impact resistance which an aromatic polycarbonate inherently possesses.

The cited reference fails to teach or suggest that the combined use of the specific components defined in claim 1 of the present application in the recited amounts is effective for solving the above-

mentioned technical dilemma (where some of the above-mentioned properties are improved and other properties sacrificed) and for obtaining a flame retardant aromatic polycarbonate resin composition which simultaneously exhibits the above-mentioned excellent effects (1) and (2) above.

With respect to Hirai et al, while this reference discloses the components recited in claim 1, Hirai et al fails to teach or suggest the combined use of the components defined in claim 1 in the amounts recited therein, together with the excellent effects achieved thereby. In fact, none of the compositions obtained in the Examples of Hirai et al meet the requirements of the present invention. The reference thus cannot be said to anticipate the claimed invention.

As is apparent from Table 1 at column 12 and Tables 2 and 3 at columns 13 and 14 of Hirai et al, the compositions obtained in Examples 1 to 6, 8 to 13 and 15 of Hirai et al contain no alkali metal salt (C) of an organic sulfonic acid. When alkali metal salt (C) is not used, the flame retardancy of the resultant composition becomes poor (see page 50, lines 13 to 19 of the present specification).

Further, as is apparent from Tables 2 and 3 at columns 13 and 14 of Hirai et al, the compositions of Examples 7 and 14 of Hirai et al contain too large an amount of oxide particles (B). Specifically, in Example 7 of Hirai et al, 2.4 parts by weight of silicone powder 1 is used ("60 wt% linear polydimethylsiloxane having a viscosity of 60,000 cSt was carried on 40 wt% of silica and powdered" (column 11, lines 33-36 of Hirai et al)). Therefore, the amount of silica oxide particles in Example 7 of Hirai et al is calculated to be $2.4 \text{ parts by weight} \times 40 \% = 0.96 \text{ part by weight}$.

Further, in Example 14 of Hirai et al, in addition to 1.2 parts by weight of silicone powder 1, 1.2 parts by weight of silicone powder 2 ("60 wt% linear dimethylsiloxane having a methacrylic group was carried on 40 wt% of silica and powdered" (column 11, lines 33-36 of Hirai et al)) is used. The amount of silica in each of silicone powder 1 and silicone powder 2 is calculated to be $1.2 \text{ parts by weight} \times 40 \% = 0.48 \text{ part by weight}$. Therefore, the total amount of silica in the composition obtained in Example 17 of Hirai et al is 0.96 part by weight.

When the amount of oxide particles (B) is larger than the amount of 0.01 to 0.5 part by weight defined in claim 1 of the present application, the flame retardancy and melt stability of the resultant

composition become poor (see page 42, lines 8 to 13 of the present specification).

The importance of the use of component (C) is apparent from a comparison between Example 4 and Comparative Example 6 (see Table 2 on page 78 of the present specification), and the criticality of the amount of component (B) is apparent from a comparison of Example 6 and Comparative Example 9 (see the above-mentioned Table 2). For easy reference, the relevant data of Table 2 are excerpted and summarized in Table A below.

		Ex. 4	Ex. 6	Comp. Ex. 6	Comp. Ex. 9
Component (A)	PC-1 [part by weight]	100	100	100	100
Component (B)	Oxide particles 1 [part by weight]	0.3	0.3	0.3	<u>0.9</u>
Component (C)	C ₄ F ₉ SO ₃ K [part by weight]	0.1	0.03	<u>0</u>	0.03
Component (D)	PTFE/AS [part by weight]	0.2	0.6	0.2	0.6
Other Components	I-1076 [part by weight]	0.03	0.03	0.03	0.03
	P-168 [part by weight]	0.01	0.01	0.01	0.01
Average particle diameter of component (B) particles [nm]		85	115	88	135
Percentage of component (B) particles which have a particle diameter in the range of 10-200 nm [%]		94	74	89	65
Whether or not the oxide particles used have a branched structure		Yes	Yes	Yes	Yes
U L -94 flame retardancy	Sample thickness: 1.50mm	<u>V-0</u>	<u>V-0</u>	V-2	V-0
	Sample thickness: 0.80mm	-	<u>V-1</u>	-	V-2
	Sample thickness: 2.00mm	-	-	-	-
Heat distortion temperature [°C]		126	126	-	125
Impact resistance [J/m]		645	640	-	420
Flexural modulus [Mpa]		2,400	2,380	-	2,420
Melt stability	Izod impact strength [J/m]	<u>620</u>	<u>630</u>	-	245
	Brittle fracture [number of specimen]	<u>0</u>	<u>0</u>	-	4

Table A above shows:

- that the composition of Example 4 and the composition of Comparative Example 6 are the same with the exception that the Composition of Example 6 does not contain component (C),
- that the composition of Comparative Example 6 exhibits a poor flame retardancy (V-2 when the sample thickness is 1.5 mm) as compared to that of Example 4 (V-0 when the sample thickness is 1.5 mm), and
- that, therefore, it is apparent that the use of component (C) is essential for obtaining the flame retardant aromatic polycarbonate resin composition of the present invention which simultaneously exhibits (1) excellent flame retardancy without using a conventional bromine-containing or phosphorus-containing flame retardant (which adversely affects the properties of the resin composition due to the unsatisfactory thermal stability thereof, and is harmful to the environment); and (2) excellent melt stability without sacrificing the excellent thermal resistance and impact resistance which an aromatic polycarbonate inherently possesses.

Table A also demonstrates:

- that the composition of Example 6 and the composition of Comparative Example 9 are the same except that the composition of Comparative Example 9 contains component (B) in an amount larger than the upper limit of 0.5 part by weight defined in claim 1 of the present application,
- that the composition of Comparative Example 9 has a poor flame retardancy (V-2 when the sample thickness is 0.80 mm) as compared to that of Example 6 (V-1 when the sample thickness is 0.80 mm),
- that the composition of Comparative Example 9 has a poor melt stability (Izod impact strength after retention in a molding machine having a temperature of 290 °C for 40

min = 245 J/m, number of brittle-fractured specimens = 4) as compared to that of the composition of Example 6 (Izod impact strength after retention in a molding machine having a temperature of 290 °C for 40 min = 630 J/m, number of brittle-fractured specimens = 0), and

- that, therefore, it is apparent that the specific amount of 0.01 to 0.5 parts by weight of component (B) defined in claim 1 of the present application is critical for obtaining a flame retardant aromatic polycarbonate resin composition which simultaneously exhibits the above-mentioned excellent effects mentioned in item (1) and (2) above.

Thus, it is apparent that Hirai et al fails to teach or suggest the essential features of the present invention, and the excellent effects achieved thereby. The reference thus cannot be said to anticipate the claimed invention.

The rejection is thus without basis and should be withdrawn.

Rejection of Claims 1-7 under 35 USC 103(a)

Claims 1-7 stand rejected under 35 USC 103(a) as being unpatentable over Hirai et al '313 or Rajagopalan et al '357, in view of Hoover '011 or Allen et al '677. This rejection respectfully is traversed.

In support of the rejection, the Examiner states as follows:

“Hirai et al. has been discussed previously. Rajagopalan et al. teach polycarbonate, PTFE, potassium diphenylsulfone sulfonate and fumed silica in Table 2, Blend 5. While Hirai et al. do not disclose the amount of glass fiber used and Rajagopalan et al. teach 0.3 % KSS, Hoover recites polycarbonate, sulfonate, PTFE and fumed silica in claim 6 and displays 0.06-0.3 % sulfonate in column 5, lines 23-24 and 10 parts of chopped glass fibers in Example 3. Allen et al. reveal 0.1-0.4 parts of sulfonate in column 6, lines 10-14, PTFE in column 8, line 45, polycarbonate in claim 1 and fumed silica in claims 4-5. It would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the minimum effective amount of flame retardant as suggested by the secondary references, in order to lower the cost and use of the glass fiber in the amount shown by Hoover, which is the customary quantity used in polycarbonate compositions.”

As discussed above, Hirai et al fails to teach or suggest the essential features of the present invention and the above-mentioned excellent effects achieved thereby.

Further, while Rajagopalan et al discloses the various components used in the present invention, Rajagopalan et al also fails to disclose or suggest the combined use of the components described in claim 1 of the present application in the recited amounts, and the above-mentioned excellent effects achieved thereby. In fact, none of the compositions obtained in the Examples of Rajagolapan et al satisfy the requirements of the present invention.

As is apparent from Table 2 at column 11 of Rajagopalan et al, Blends 1 to 4 and 6 obtained in the Examples of Rajagopalan et al contain no branched metal oxide particles (B) as used in the present invention. When branched metal oxide particles (B) are not used, the flame retardancy of the resultant composition becomes poor (see page 42, lines 5 to 8 of the present specification).

In connection with the above, it should be noted that, as is apparent from the above-mentioned Table 2 of Rajagopalan et al, Blends 1, 3, 4 and 6 obtained in the Examples of Rajagopalan et al contain TiO_2 which has no branched structure as is apparent from the fact that Rajagopalan et al contains no description that TiO_2 has been treated to form a branched structure (whereas the modified, branched TiO_2 particles used in the present invention are obtained by subjecting TiO_2 particles (produced by the dry method) to surface treatment with octylsilane (see page 64, lines 6 to 10 of the present specification)). Even when such non-branched metal oxide particles are used instead of branched metal oxide particles (B), the flame retardancy of the resultant composition cannot be improved.

Further, as is apparent from the above-mentioned Table 2 of Rajagopalan et al, "Blend 5" noted by the Examiner contains too large an amount of an alkali metal salt (C) of an organic sulfonic acid. Specifically, Blend 5 contains 0.3 part by weight of potassium diphenylsulfone sulfonate, which falls outside the range of 0.0001 to 0.2 part by weight defined in applicants' claim 1.

When the amount of alkali metal salt (C) is larger than the amount defined in pending claim 1,

the melt stability of the resultant composition becomes poor (see page 50, lines 16 to 19 of the present specification).

The importance of the presence of component (B) is apparent from a comparison between Example 4 and Comparative Example 5 (in which no branched metal oxide particles (B) are used) (see Table 2 at page 78 of the present specification), as well as a comparison between Example 1 and Comparative Example 4 (in which non-branched TiO_2 particles are used instead of branched metal oxide particles (B)) (see Table 1 on page 73 of the present specification). The criticality of the amount of component (C) is apparent from a comparison between Example 5 and Comparative Example 8 (see the above-mentioned Table 2). For easy reference, the relevant data of Table 2 are excerpted and summarized in Table B below.

Table B

		Ex. 1	Ex. 4	Ex. 5	Comp. Ex. 4	Comp. Ex. 5	Comp. Ex. 8
Component (A)	PC-1 [part by weight]	100	100	100	100	100	100
Component (B)	Oxide particles 1 [part by weight]	0.3	0.3	0.3	<u>0</u>	<u>0</u>	0.3
Oxide particles other than component (B)	TiO ₂ particles [part by weight]	0	0	0	<u>0.3</u>	0	0
Component (C)	C ₄ F ₉ SO ₃ K [part by weight]	0.01	0.1	0.08	0.01	0.1	<u>0.3</u>
Component (D)	PTFE/AS [part by weight]	0.2	0.2	0.6	0.2	0.2	0.6
Other components	I-1076 [part by weight]	0.03	0.03	0.03	0.03	0.03	0.03
	P-168 [part by weight]	0.01	0.01	0.01	0.01	0.01	0.01
Average particle diameter of oxide particles used [nm]		90	85	92	280	-	93
Percentage of oxide particles which have a particle diameter in the range of 10-200 nm [%]		93	94	90	<20	-	83
Whether or not the oxide particles have a branched structure		Yes	Yes	Yes	No	-	Yes
UL-94 flame retardancy	Sample thickness: 1.50 mm	<u>V-0</u>	<u>V-0</u>	<u>V-0</u>	V-2	V-2	V-0
	Sample thickness: 0.80 mm	=	=	<u>V-0</u>	-	-	V-0
	Sample thickness: 2.00 mm	=	=	<u>5VB</u>	-	-	5VB
Heat distortion temperature [°C]		127	126	127	-	-	125
Impact resistance [J/m]		<u>650</u>	<u>645</u>	<u>630</u>	-	-	238
Flexural modulus [MPa]		2,410	2,400	2,430	-	-	2,390
Melt stability	Izod impact strength [J/m]	<u>635</u>	<u>620</u>	<u>625</u>	-	-	115
	Brittle fracture [number of fractured specimen(s) out of 5 specimens]	<u>0</u>	<u>0</u>	<u>0</u>	-	-	5

Table B shows:

- that the composition of Example 4 and the composition of Comparative Example 5 are the same with the exception that the composition of Comparative Example 5 does not contain component (B),
- that the composition of Comparative Example 5 exhibits a poor flame retardancy (V-2 when the sample thickness is 1.5 mm) as compared to that of Example 4 (V-0 even when the sample thickness is 0.8 mm), and
- that, therefore, it is apparent that the use of component (B) is essential for obtaining the flame retardant aromatic polycarbonate resin composition of the present invention which simultaneously exhibits the above-mentioned excellent effects mentioned in item (1) and (2) above.

Table B also shows:

- that the composition of Example 1 and the composition of Comparative Example 4 are the same with each other except that the composition of Comparative Example 4 contains non-branched TiO_2 particles instead of component (B),
- that the composition of Comparative Example 4 exhibits a poor flame retardancy (V-2 when the sample thickness is 1.5 mm) as compared to that of Example 1 (V-0 when the sample thickness is 1.5 mm), and
- that, therefore, it is apparent that the use of non-branched metal oxide particles as used in the Examples of Rajagopalan et al is ineffective for achieving the desired effects of the present invention.

Further, Table B also shows:

- that the composition of Example 5 and the composition of Comparative Example 8 are the same except that the composition of Comparative Example 8 contains component (C) in an amount of 0.3 part by weight which is greater than the upper limit of 0.2 part by weight defined in claim 1 of the present application,

- that the composition of Comparative Example 8 has a poor melt stability (Izod impact strength after retention in a molding machine having a temperature of 290 °C for 40 min = 115 J/m, number of brittle-fractured specimens = 5) as compared to that of Example 5 (Izod impact strength after retention in a molding machine having a temperature of 290 °C for 40 min = 625 J/m, number of brittle-fractured specimens = 0), and
- that, therefore, it is apparent that the specific amount of 0.0001 to 0.2 part by weight of component (C) defined in claim 1 of the present application is critical for obtaining a flame retardant aromatic polycarbonate resin composition of the present application which simultaneously exhibits the excellent effects mentioned in items (1) and (2) above.

The remaining of the cited references do not cure the deficiencies of the primary references as they are relied upon to teach various embodiments of the dependent claims, and fail to teach or suggest any of the above-mentioned essential features of the present invention or the excellent effects achieved thereby. The cited references, taken either singly or in combination, thus do not render obvious the claimed invention.

The rejection is thus without basis and should be withdrawn.

Double Patenting Rejection

Claims 1-7 stand provisionally rejected on the ground of obviousness-type double patenting over claims 1-13 of application No. 10/507,903, as well as over claims 1-8 of application No. 10/504,297.

As this is a provisional rejection, no action is required at this time by applicants. However, applicants will endeavor to maintain a line of distinction between the respective sets of claims.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Raymond C. Stewart (Reg. No. 21,066) at the

telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

A check in the amount of \$120.00 is attached hereto as payment for the requested one month extension of time.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.

Dated: December 19, 2005

Respectfully submitted,

By

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Attachment: Declaration regarding translation errors